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(54) THIN SWITCH AND DISPLAY PANEL WITH SWITCH

(57)Abstract:

PROBLEM TO BE SOLVED: To make the best use of the feature of a touch panel so that it can be made extremely thin and at the same time to perceive the operation of a switch part by finger.

SOLUTION: This display panel with a switch has structure in which a thin switch 50 is disposed in the upper vicinity of a display panel 2 having an information displaying function. The thin switch 50 is provided with a resistance film touch panel 4 having one or more switch parts 4a in the rear vicinity of a touch surface 4b and capable of being operated by the push-in stroke of nearly zero and a vibration source 30 for vibrating the whole of the touch panel 4 including the touch surface 4b in response to the operation of at least one of the switch parts 4a of the touch panel 4. Therefore, the operation of the switch parts 4a of the touch panel 4 can be perceived by finger

with the vibrations of the touch panel 4b.

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CLAIMS

[Claim(s)]

[Claim 1]A thin switch comprising:

A touch panel operational with about 0 in a stroke which has one or more switch parts a table of a touch surface thru/or near back, and pushes it in.

It answers that at least one switch part of this touch panel was operated, and is an excitation means of the touch panel concerned which vibrates a touch surface at least.

[Claim 2]A display panel with a switch characterized by comprising the following.

A display panel which has an information display function.

A transparent or translucent touch panel operational with about 0 in a stroke which is arranged near the upper part of this display panel, has one or more switch parts a table of a touch surface thru/or near back, and pushes it in.

It answers that at least one switch part of this touch panel was operated, and is an excitation means of the touch panel concerned which vibrates a touch surface at least.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the thin switch used for FA (factory

automation) apparatus, a vending machine, an automatic ticket vending machine, information machines and equipment, a home electric product, the operation equipment of medical application, etc., for example, and the display panel with a switch using it.

[0002]

[Description of the Prior Art]A touch panel is one of the typical things of a thin switch. If it summarizes, the touch panel has [near / which people touch / the table of a touch surface thru/or near back] one or more switch parts, pushes it in, and a stroke is about 0, namely, it can say it as the switch of operational panel shape by whether it touches and the grade pushed lightly.

[0003]The resistance film system which opened few spaces for the up-and-down transparent electrode between ** transparent thin plates, and was made to counter such a touch panel (this is also called a transparent electrode type.) There are a photoelectric method which intercepts or attenuates with a finger etc. that the light which came out of the same ** light emitting device below goes into a photo detector, an ultrasonic system which intercepts or attenuates with a finger etc. that the ultrasonic wave which came out of ** ultrasonic oscillating element goes into a vibration receiving element, other electric capacity types, etc.

[0004]Such a touch panel is used as a display panel with a switch by piling it as a thin switch up by independent [its] on the display panel which has an information display function.

[0005]

[Problem(s) to be Solved by the Invention]Although it has the feature that a touch panel can be slimmed down extremely, Since the pushing stroke of a switch part is about 0 unlike the switch with which it has the usual switch mechanism in [any] the method of the above, Since a click feeling cannot be taken out, there is a problem that it cannot perceive surely having operated the switch part (it was made one typically) with a finger. Then, the person who operated it does not know whether surely the switch part was operated, but becomes uneasy.

[0006]In order to compensate this, when the switch part of a touch panel was operated conventionally, the method of changing the display of the liquid crystal display etc. which were combined with the touch panel, and the method of making the sound of a buzzer etc. were used together.

[0007]However, in the method of changing a display, when the operator has turned to width, when it is a visually handicapped person, it cannot check.

[0008]In the method of making a sound, when a noisy place and an operator are persons hard of hearing, it cannot check. At the place which will be troubled if a sound comes out, this sound becomes obstructive.

[0009]It is most natural to perceive to have operated the switch part after all with the finger of the person who operated it, and it is rational.

[0010]Then, this invention sets it as the main purpose to provide the display panel with a switch using the thin switch and it which can detect having operated that switch part with a finger, employing efficiently the feature of a touch panel that it can slim down extremely.

[0011]

[Means for Solving the Problem]This invention is characterized by a thin switch comprising the following.

A touch panel operational with about 0 in a stroke which has one or more switch parts a table of a touch surface thru/or near back, and pushes it in.

It answers that at least one switch part of this touch panel was operated, and is an excitation means of the touch panel concerned which vibrates a touch surface at least.

[0012]This invention is characterized by a display panel with a switch comprising the following.

A display panel which has an information display function.

A transparent or translucent touch panel operational with about 0 in a stroke which is arranged near the upper part of this display panel, has one or more switch parts a table of a touch surface thru/or near back, and pushes it in.

It answers that at least one switch part of this touch panel was operated, and is an excitation means of the touch panel concerned which vibrates a touch surface at least.

[0013]A touch surface is a field which a person of a touch panel touches. A table of a touch surface thru/or the neighborhood of back mean that any near back [of a touch surface] the surface of a touch surface itself and near front [of a touch surface] may be sufficient. Operation of a switch part is meaning changing a state of a switch part and making it one typically.

[0014]According to the above-mentioned thin switch, if a switch part of the touch panel is operated, it will be answered and it will get across to a finger of a person of the touch panel concerned whom a touch surface was vibrated at least and the vibration operated by an excitation means. Therefore, it can perceive having operated a switch part with a finger by vibration of a touch surface.

[0015]Since a display panel with the above-mentioned switch is having substantially structure which has arranged the above thin switches which used a touch panel near the upper part of a display panel, It can perceive having operated a switch part of a touch panel by the same operation as the above-mentioned thin switch with a finger by vibration of a touch surface. And since between a touch panel and display panels can be made to approach and display information of a display panel will be displayed by it immediately near the touch panel, the display information is dramatically legible.

[0016]

[Embodiment of the Invention]Drawing 1 is a sectional view showing the example of the display panel with a switch using a thin switch provided with a resistance film system touch panel. In this example, the one or more switch parts 4a are formed near back [of the touch surface 4b of the touch panel 4].

[0017]The display panel with a switch of this example arranges the display panel 2 which has an information display function at the pars basilaris ossis occipitalis in the case 20, and it is making it structure which has arranged the thin switch 50 near the upper part of this display panel 2.

[0018]It is not asked whether the information which the display panel 2 has an information display function in short, ****s it, and is displayed is a constant, or it is variable information, or is spontaneous light, and whether it has a back light etc. For example, although this display panel 2 is a liquid crystal display typically, In addition, a mere sheet, a plate, etc. which indicated EL (electroluminescent element) display, a plasma display, CRT, an LED array, the thing that combined the inprinting board and liquid crystal shutter which display information, and the photogen which illuminates it and a light reflector, and also information may be sufficient. the display panel 2 -- for example, a sheet, a plate, etc. -- like -- **** -- in the case of a thin thing, it may be attached to the rear face of the touch panel 4.

[0019]What is necessary is just to select the structure of the case 20 suitably according to the kind of display panel 2, etc. The case for thin switch 50 and the case for display panel 2 may be set aside.

[0020]In this example, the viewing area 2a which displays the contents chosen near the lower part of each switch part 4a of the touch panel 4 which constitutes the thin switch 50 by operation of the switch part 4a concerned is formed in the display panel 2, respectively. Therefore, selection and operation of the desired switch part 4a become easy.

[0021]The thin switch 50 is provided with the following.

The touch panel 4 of a resistance film system [this example].

The source 30 of excitation which constitutes the excitation means which vibrates the touch-panel 4 whole which answers that at least one switch part 4a of this touch panel 4 was operated, and includes the surface touch surface 4b.

[0022]This touch panel 4 forms the one or more switch parts [one / the switch parts / by being lightly pushed from the outside (that is, a stroke. about 0)] 4a near the surface of a hard board, and, moreover, its whole is transparent or translucent in this example. Like [if an example is shown more] the example shown, for example in drawing 2, the touch panel 4 changes in piles the transparent thin plate 16 with which the transparent thin plate 10 which has two or more openings 12 was piled up, and also the transparent electrode 18 was formed on it at the undersurface on the

transparent hard board 6 by which the transparent electrode 8 was formed in the upper surface. The transparent electrodes 8 and 18 may also have a case of the electrode of two or more stripe shape which intersects perpendicularly mutually, one electrodes 18, for example, a transparent electrode, may be two or more electrodes, and the electrode 8 of another side, for example, a transparent electrode, may be a common electrode. Since the transparent thin plate 16 is sheet metal, it has flexibility. [0023]The hard board 6 is used [since the touch-panel 4 whole is floated from the display panel 2,] downward in order to maintain the flat plate shape, and to make vibration from the source 30 of excitation easy to tell the touch-panel 4 whole. This hard board 6 comprises a transparent acrylic board and clear glass board etc., for example. But the comparatively soft touch panel formed using the transparent sheet may be piled up on a substrate hard [other] (on a hard board transparent in the case of this example). Instead of providing the hard board of touch-panel 4 exclusive use, the display panel 2 may be made into a hard thing, and it may be made to serve as the above-mentioned hard board.

[0024]In this touch panel 4, that surface more specifically the surface of that transparent thin plate 16, If the switch part 4a is formed in the portion of each opening 12 which is the touch surface 4b which people touch, and is near [the] the back side and the portion of the desired opening 12 is lightly pushed from the transparent thin plate 16 side, One [the transparent thin plate 16 and the transparent electrode 18 of a portion which were pushed bend, and / the transparent electrode / the transparent electrode 18 contacts the lower transparent electrode 8 through the opening 12, and] electrically. however, the size of each switch part 4a, shape, a position, a number, etc. may use two or more small switch parts 4a as one (namely, -- carrying out multiple connection electrically) switch part collectively arbitrarily.

[0025]Although the edge part of this touch panel 4 may be directly fixed to the case 20 again with reference to drawing 1, In this example, in order to carry out that it is easy to vibrate the touch-panel 4 whole, the touch panel 4 is floated from the case 20, and that edge part is supported from the case 20 via two or more elastic bodies 24. This elastic body 24 is attached, for example near the four corners of the touch panel 4. Although plate-like flat spring like the example shown in drawing 1 may be sufficient as each elastic body 24 for example, if it is made into the flat spring of the shape of a corrugated panel like the example shown in drawing 4, it will become that it is much more easy to vibrate the touch panel 4. A coil spring may be sufficient as each elastic body 24, in addition rubber, sponge, etc. may be sufficient as it.

[0026]In this example, although the edge part 22 of the case 20 has hung on the edge part of the touch panel 4 and may carry out direct contact of this edge part 22 and touch panel 4, in order to carry out that it is easy to vibrate the touch panel 4, the small crevice 26 is established in this example. When establishing the crevice 26, the elastic body 42 which has water proof and a dustproof function may be formed there

like the example shown, for example in drawing 5. This elastic body 42 is sponge, rubber membrane, etc., for example. This thin switch 50 whole can be easily made into water proof and the dustproof structure, making vibration of the touch panel 4 easy, if the above elastic bodies 42 are formed, since the touch panel 4 has neither a hole nor a crevice and it has water proof and a dustproof function from the first.

[0027]Between the edge part of the above-mentioned touch panel 4, and the case 20, the source 30 of excitation which vibrates the touch-panel 4 whole including the touch surface 4b is established in this example. But although it is the touch surface 4b that it is necessary to make it vibrate truly, since the surface of the touch panel 4 is the touch surface 4b as it is in this example, it is not indispensable to only use to vibrate the touch-panel 4 whole, and to vibrate the touch-panel 4 whole. Although the number of these sources 30 of excitation may be one, if they are made into plurality and it is distributed and arranged to the edge part of the touch panel 4, they can vibrate the touch-panel 4 whole more uniformly.

[0028]Each source 30 of excitation is a piezoelectric transducer as an example in this example. A piezoelectric transducer is an element which vibrates a piezoelectric board by impressing a volts alternating current to inter-electrode [which was provided in both sides of the piezoelectric board] as everyone knows. An electrostrictive actuator is one of those which have the almost same structure as this piezoelectric transducer, and it may be used for this source 30 of excitation.

[0029]The frequency which vibrates the touch panel 4 by the source 30 of excitation, Since it will become the rude thing in which the feel which gets across to a finger was rough if not much low, and a finger will become ticklish if not much high, it is preferred to carry out within the limits of 50 Hz – 150 Hz, and especially within the limits of 80 Hz – 130 Hz is preferred also among them. Also in other examples, it is the same.

[0030]An example of a drive circuit which drives each source 30 of excitation electrically is shown in drawing 3.

[0031]The touch panel 4 has the transparent electrode 8 of m line, and the transparent electrode 18 of n sequence in this example (m and n are one or more integers), and is the switch part 4a which each of those intersections mentioned above. Each of these transparent electrodes 8 and 18 are pulled out in order to connect with the circuit (graphic display abbreviation) of the exterior which specifies the switch part 4a to which pressing operation was performed, and they are connected to the detector circuit 52.

[0032]The detector circuit 52 detects that at least one switch part 4a of the touch panel 4 was operated, and while the switch part 4a concerned is operated, it outputs the predetermined level S, for example, the detecting signal of a high level, all the time. This detector circuit 52 can consist of publicly known art, for example using the 1st OR circuit by which the transparent electrode 8 of 1 – m line was connected to the input part, the 2nd OR circuit by which the transparent electrode 18 of 1 – n sequence

was connected to the input part, and the AND circuit which asks for and [of the output from both OR circuits].

[0033]The detecting signal S from this detector circuit 52 is given to the exchange oscillator 54. While answering this detecting signal S and giving it, the exchange oscillator 54 is put in block in each source 30 of excitation, supplies a volts alternating current, and drives them. Between this exchange oscillator 54 and the source 30 of excitation, an amplifying circuit may be provided if needed. Since the frequency of the output of this exchange oscillator 54 and the frequency of vibration of the source 30 of excitation are mutually equal fundamentally, as mentioned above, as for the frequency of the output of this exchange oscillator 54, it is preferred to carry out within the limits of 50 Hz – 150 Hz, and especially its within the limits of 80 Hz – 130 Hz is preferred also among them.

[0034]May attach this detector circuit 52 and the exchange oscillator 54 to the thin switch 50 of this example by storing in the case 20 mentioned above, and, It may store in the apparatus of the other party to which this thin switch 50 is connected, without making it such, or may constitute using a circuit, a microcomputer, etc. which were formed there. The same may be said of the detector circuits 92 and 108 mentioned later.

[0035]If it is made one by pushing the one arbitrary switch part 4a of the touch panel 4 if operation of the thin switch 50 shown in drawing 1 is explained, It is detected by the detector circuit 52, the detecting signal S is outputted from there, according to it, a volts alternating current is supplied to each source 30 of excitation from the exchange oscillator 54, each source 30 of excitation vibrates, and the touch-panel 4 whole which includes the touch surface 4b by it is vibrated. And it gets across to the finger of the person whom vibration of this touch panel 4 operated. Therefore, it can perceive having operated the switch part 4a with the operated finger. As a result, sense of security can be given to the person who operated it.

[0036]If the pressing operation of the switch part 4a of the touch panel 4 is stopped, the switch part 4a concerned is turned off by itself, it will be answered, the output of the detecting signal S from the detector circuit 52 and the output of the volts alternating current from the exchange oscillator 54 will stop, and vibration of the touch panel 4 will stop.

[0037]Thus, it is a finger of the person who operated it in this thin switch 50, and since what (it was made one typically) the switch part 4a of the request of the touch panel 4 was operated for can be perceived, it is the most natural and rational. Therefore, unlike the method of changing the display of the display panel of a conventional example, when the operator has turned to width, also when it is a visually handicapped person, it can perceive certainly. Unlike the method of making the sound of a conventional example, also when a noisy place and an operator are persons hard of hearing, it can perceive certainly. It can be used convenient at all also at the place

which will be troubled if a sound comes out.

[0038]The display panel with the above-mentioned switch using such a thin switch 50, Since between the touch panel 4 and the display panels 2 can be made to approach and the display information of the display panel 2 will be displayed by it immediately near the touch panel 4, in addition to the above effects of the thin switch 50, the effect that the display information of the display panel 2 is very legible is also acquired.

[0039]Each source 30 of excitation is things other than the piezoelectric transducer mentioned above or an electrostrictive actuator, and may be constituted. Also in other examples mentioned later, it is the same.

[0040]For example, the source 30 of excitation may consist of the electromagnet 32 which wound the coil 36 around the iron core 34, and the permanent magnet 38 attached to the touch panel 4 so that a crevice might be opened in it and it might be countered like the example shown in drawing 4. Alternating current is supplied from the exchange oscillator 54 mentioned above on this electromagnet 32. In the magnetic pole of the iron core 34, N and S can occur by turns by it, the permanent magnet 38 which counters it can be attracted or repelled, and the touch panel 4 can be vibrated by it. The number of the magnetic poles of the iron core 34 may be one, and they should just make the n pole or the south pole of the permanent magnet 38 counter it in that case. Although ferromagnetics, such as a griddle, may be used instead of the permanent magnet 38, since the direction which uses the permanent magnet 38 can also use the magnetism, exciting force becomes larger. If it puts in another way, the output of the exchange oscillator 54 can be made small and power-saving can be attained.

[0041]The source 30 of excitation may consist of electromagnetism solenoids which have the plunger connected to the touch panel 4, a coil which attracts it, etc. Alternating current is supplied from the exchange oscillator 54 mentioned above in this electromagnetism solenoid. By it, a plunger can vibrate and the touch panel 4 can be vibrated.

[0042]The source 30 of excitation has attached the weight which carried out eccentricity to the axis of rotation, and may constitute it from a vibrating motor with which the motor itself vibrates. In that case, what is necessary is just to provide DC power supply or the amplifying circuit which amplifies the detecting signal S instead of the exchange oscillator 54 mentioned above. The touch panel 4 can be vibrated by contacting or attaching this vibrating motor to the touch panel 4, and rotating it.

[0043]In order that the touch panel 4 might combine with the display panel 2 arranged downward in the case of the above-mentioned example, as it mentioned above, considered it as the transparent thing, but. It does not necessarily need to be transparent, and may be translucent and what is necessary is just to be, able to penetrate the light from the lower display panel 2 in short according to the display information of the display panel 2, etc.

[0044]The above-mentioned thin switch 50 can also be used, without piling up on the display panel 2, for example, is independent separately [the display panel 2] about the thin switch 50, Or since it can also be used combining other apparatus and it is not necessary to make the light from the lower display panel 2 penetrate in that case, the touch panel 4 does not need to be transparent or translucent, and may be opaque. In that case, for discernment of the switch part 4a, etc., necessity may be accepted, and a character, a sign, etc. may be filled in, stamped and stuck on the surface of the touch panel 4. Also in other examples mentioned later, it is the same.

[0045]By the way, the touch panel of the photoelectric method with which the light to which the touch panel came out of the light emitting device besides the resistance film system above touch panels 4 is [a thing / it] intermittent or attenuates going into a photo detector, Or the touch panel of the ultrasonic system which is [a thing / it] intermittent or attenuates that the ultrasonic wave which came out of the ultrasonic oscillating element goes into a vibration receiving element may be sufficient. Then, next, the example using the touch panel of a photoelectric method or the touch panel of the ultrasonic system is described. However, the same portion as a previous example omits duplication explanation, and explains a point of difference with a previous example to a subject.

[0046]Drawing 6 is a sectional view showing selectively an example in case the touch panel 114 is a photoelectric method, and since the portion below the touch panel 114 is the same as that of a previous example, the graphic display is omitted here. In this example, the one or more switch parts 114a are formed near front [of the touch surface 114b of the touch panel 114].

[0047]The touch panel 114 also refers to drawing 7, and carry out for [of two or more photo detectors 90 which change it into an electrical signal in response to two or more light emitting devices 84 which output the light 86, and the light 86 concerned] relativity in all directions into the edge part 22 of the case 20, and it arranges them, Composition in which the matrix form optical path 88 was formed to the space near the surface of the hard board 82 is carried out. Near the intersection of the two optical paths 88 serves as the switch part 114a, respectively. The number of the optical paths 88 which carry out matrix arrangement is arbitrary at $m \times n$ (m and n are one or more integers).

[0048]The hard board 82 comprises a transparent or translucent glass plate or acrylic board, for example. Each light emitting device 84 is LED, a semiconductor laser, etc., for example. Each photo detector 90 is a photo-diode, a photo transistor, etc., for example. It is the same as that of the case of a previous example whether the elastic body which has water proof and a dustproof function is provided in whether a crevice is opened between this hard board 82 and the edge part 22 of the case 20 and there.

[0049]Since infrared light is not conspicuous, the light 86 outputted from each light emitting device 84 is preferred, but, of course, visible light may be sufficient as it. The

method made to always emit light may be sufficient as the method which makes each light emitting device 84 emit light, and the method (this is also called a luminescence method or a scanning method one by one) made to emit light in order using a microcomputer etc. may be sufficient as it. This microcomputer may be used also [what / constitutes the detector circuit 92 explained below, for example].

[0050]As this example shows to each photo detector 90 in every direction at drawing 7, the signal from each photo detector 90 is answered, The function which outputs the position signal P which detects the position (coordinates) of the intersection of the optical path 88 to which light volume fell, namely, specifies the switch part 114a to which operation was performed, and with which the position is expressed, The detector circuit 92 which has a function which outputs the detecting signal S which detected and mentioned above that at least one switch part 114a was operated is connected. It is the same as that of the case of the example mentioned above after the exchange oscillator 54, and explanation of the operation is omitted.

[0051]The surface of the hard board 82 is the touch surface 114b which people touch, and it is made to vibrate in this example by the source 30 of excitation which mentioned above the hard board 82 whole which forms this touch surface 114b. That is, if the touch surface 114b is touched with a finger, the optical path 88 is interrupted with a finger and the arbitrary switch parts 114a are operated, it is detected by the detector circuit 92, it is answered, with the exchange oscillator 54, the source 30 of excitation will drive, the hard board 82 will vibrate, and it will get across to a finger. Therefore, it can perceive having operated the switch part 114a with the operated finger.

[0052]The hard board 82 may make that display panel 2 serve as the above-mentioned hard board, since the main functions form the touch surface 114b in this example, when the hard display panel 2 (refer to drawing 1) is arranged downward. That is, it is good also considering the surface of the display panel 2 as a touch surface to omit the hard board 82. In that case, what is necessary is just to vibrate the surface by the source 30 of excitation, even if there are few these display panels 2.

[0053]Drawing 8 is a sectional view showing selectively an example in case the touch panel 124 is an ultrasonic system, and since the portion below the touch panel 124 is the same as that of the case of a previous example, the graphic display is omitted here. In this example, the one or more switch parts 124a are formed in the surface of the touch surface 124b of the touch panel 124 itself.

[0054]This touch panel 124 is based on the same technical thought as the touch panel indicated, for example to U.S. Pat. No. 5,177,327.

[0055]Namely, this touch panel 124 also refers to drawing 9, and make the surface of the edge part of the hard board 94 carry out for [of it] relativity in all directions, arrange it, and two or more vibration receiving elements 106 which change it into an electrical signal in response to two or more oscillation elements 96 which output the

ultrasonic wave 100, and the ultrasonic wave 100 concerned on the surface of the hard board 94. Composition in which the matrix form ultrasonic course 102 was formed is carried out. Near the intersection of the two ultrasonic courses 102 serves as the switch part 124a, respectively. In this case, since the ultrasonic wave 100 has very high directivity, a possibility that the ultrasonic wave 100 which spreads the one ultrasonic course 102 may enter and interfere in the next ultrasonic course 102 does not usually have it. The number of the ultrasonic courses 102 which carry out matrix arrangement is arbitrary at $m \times n$ (m and n are one or more integers).

[0056]The hard board 94 is a transparent or translucent glass substrate, for example.

[0057]The ultrasonic wave 100 is a surface acoustic wave in this example, the ultrasonic wave 100 from the oscillation element 96 is led to the surface of the substrate 94 via the waveguide 98, and the ultrasonic wave 100 of the surface of the substrate 94 is led to the vibration receiving element 106 via the waveguide 104. Each oscillation element 96 and each vibration receiving element 106 are piezoelectric transducers, for example. These are dedicated to the space part in the edge part 22 of the case 20 in this example. It is the same as that of the case of a previous example whether the elastic body which has water proof and a dustproof function is provided in whether a crevice is opened between the edge part 22 of this case 20 and the substrate 94 and there.

[0058]As this example shows to each vibration receiving element 106 in every direction at drawing 9, the signal from each vibration receiving element 106 is answered, The function which outputs the position signal P which detects the position (coordinates) of the intersection of the ultrasonic course 102 which the ultrasonic wave 100 decreased, namely, specifies the switch part 124a to which operation was performed, and with which the position is expressed, The detector circuit 108 which has a function which outputs the detecting signal S which detected and mentioned above that at least one switch part 124a was operated is connected. It is the same as that of the case of the example mentioned above after the exchange oscillator 54, and explanation of the operation reduces a labor.

[0059]The surface of the hard board 94 is the touch surface 124b which people touch, and it is made to vibrate in this example by the source 30 of excitation which mentioned above the hard board 94 whole including this touch surface 124b. That is, if the touch surface 124b is touched with a finger, the ultrasonic wave 100 is absorbed with a finger and the arbitrary switch parts 124a are operated, it is detected by the detector circuit 108, it is answered, with the exchange oscillator 54, the source 30 of excitation will drive, the hard board 94 will vibrate, and it will get across to a finger. Therefore, it can perceive having operated the switch part 124a with the operated finger.

[0060]The distortional wave which spreads the inside of the hard board 94 may be used instead of the above surface acoustic waves as the ultrasonic wave 100. In that

case, the oscillation element 96 and the vibration receiving element 106 are attached to the end face in which the hard board 94 carries out for relativity. This method is also called inner surface waveguide type. In the case of this method, it is possible that the one or more switch parts 124a which were mentioned above are formed near back [of the touch surface 124b of the surface of the hard board 94].

[0061]Although each made the excitation direction of the touch surface by the source 30 of excitation the sliding direction of the touch surface in the above-mentioned example, it is not limited to it, it may be aimed to meet the direction of other, for example, a touch surface, and, in short, a touch surface should just vibrate.

[0062]On the surface of the all directions-type touch panel mentioned above, like the example shown, for example in drawing 10, Since a finger can be positioned with few level differences produced into the portion of the through hole 134 if the transparent thin plate 132 which has the through hole 134 may be put on the portion corresponding to the switch part of those touch panels and it is made such, positioning of the finger to a switch part becomes easily and certain. The portion which that becomes thin and has a level difference in it although penetration has not been carried out instead of the through hole 134 to this transparent thin plate 132 may be provided, and even if it makes it such, the same effect as the above is acquired.

[0063]

[Effect of the Invention]Since this invention is constituted as above-mentioned, it does the following effects so.

[0064]Since the above excitation means were combined with the touch panel according to the thin switch according to claim 1, it can perceive having operated the switch part of the touch panel with a finger by vibration of the touch surface of a touch panel. That is, it can perceive having operated the switch part with a finger, employing efficiently the feature of a touch panel that it can slim down extremely. As a result, sense of security can be given to the person who operated it.

[0065]Thus, since it can perceive having operated the switch part of the touch panel with the finger of the person who operated it according to this thin switch, it is the most natural and rational. Therefore, unlike the method of changing the display of the display panel of a conventional example, when the operator has turned to width, also when it is a visually handicapped person, it can perceive certainly. Unlike the method of making the sound of a conventional example, also when a noisy place and an operator are persons hard of hearing, it can perceive certainly. It can be used convenient at all also at the place which will be troubled if a sound comes out.

[0066]Since the display panel with a switch according to claim 2 is having structure which has arranged the thin switch [like] according to claim 1 which used the touch panel near the upper part of a display panel, it can detect having operated the switch part of the touch panel with a finger by vibration of a touch surface. Therefore, the

same effect as the thin switch of being able to give sense of security to the person who operated it according to claim 1 is done so.

[0067] And since between a touch panel and display panels can be made to approach and the display information of a display panel will be displayed by it immediately near the touch panel, the effect that the display information is very legible also does so.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a sectional view showing the example of the display panel with a switch using a thin switch provided with a resistance film system touch panel.

[Drawing 2] It is a sectional view decomposing and showing an example of a resistance film system touch panel.

[Drawing 3] It is a figure showing an example of a circuit which drives the source of excitation electrically.

[Drawing 4] It is a sectional view which expands the example which used the electromagnet to the source of excitation, and is shown selectively.

[Drawing 5] It is a sectional view which expands the example which provided the elastic body which has water proof and a dustproof function, and is shown selectively.

[Drawing 6] It is a sectional view showing selectively an example in case a touch panel is a photoelectric method.

[Drawing 7] It is a top view showing the touch panel of drawing 6 with the circuit which drives the source of excitation electrically.

[Drawing 8] It is a sectional view showing selectively an example in case a touch panel is an ultrasonic system.

[Drawing 9] It is a top view showing the touch panel of drawing 8 with the circuit which drives the source of excitation electrically.

[Drawing 10] It is a top view showing an example of the transparent thin plate piled up on a touch panel.

[Description of Notations]

2 Display panel

4 A resistance film system touch panel

4a Switch part

4b Touch surface

30 The source of excitation

32 Electromagnet

38 Permanent magnet

50 Thin switch

52 Detector circuit

54 Exchange oscillator

114 The touch panel of a photoelectric method

114a Switch part

114b Touch surface

124 The touch panel of an ultrasonic system

124a Switch part

124b Touch surface

operational with about 0 in a stroke which is arranged near the upper part of this display panel has one or more switch parts a table of a touch surface thru/or near back and pushes it in.
It answers that at least one switch part of this touch panel was operated and is an excitation means of the touch panel concerned which vibrates a touch surface at least.

</SDO>
<HR>DETAILED DESCRIPTION<HR><SDO DEJ><TXF FR=0002 HE=170 WI=080 LX=0200 LY=1100>[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the thin switch used for FA (factory automation) apparatus a vending machine an automatic ticket vending machine information machines and equipment a home electric product the operation equipment of medical application etc. for example and the display panel with a switch using it.
[0002]
[Description of the Prior Art] A touch panel is one of the typical things of a thin switch. If it summarizes the touch panel has [near / which people touch / the table of a touch surface thru/or near back] one or more switch parts pushes it in and a stroke is about 0 namely it can say it as the switch of operational panel shape by whether it touches and the grade pushed lightly.
[0003] The <GAI ID=0001>resistance film system which opened few spaces for the up-and-down transparent electrode between ** transparent thin plates and was made to counter such a touch panel (this is also called a transparent electrode type.) There <GAI ID=0002><GAI ID=0003>are a photoelectric method which intercepts or attenuates with a finger etc. that the light which came out of the same ** light emitting device below goes into a photo detector an ultrasonic system which intercepts or attenuates with a finger etc. that the ultrasonic wave which came out of ** ultrasonic oscillating element goes into a vibration receiving element other electric capacity types etc.
[0004] Such a touch panel is used as a display panel with a switch by piling it as a thin switch up by independent [its] on the display panel which has an information display function.
[0005]
[Problem(s) to be solved by the Invention] Although it has the feature that a touch panel can be slimmed down extremely since the pushing stroke of a switch part is about 0 unlike the switch with which it has the usual switch mechanism in [any] the method of the above since a click feeling cannot be taken out there is a problem that it cannot perceive surely having operated the switch part (it was made one typically) with a finger. Then the person who operated it does not <TXF FR=0003 HE=250 WI=080 LX=1100 LY=0300> know whether surely the switch part was operated but becomes uneasy.
[0006] In order to compensate this when the switch part of a touch panel was operated conventionally the method of changing the display of the liquid crystal display etc. which were combined with the touch panel and the method of making the sound of a buzzer etc. were used together.
[0007] However in the method of changing a display when the operator has turned to width when it is a visually handicapped person it cannot check.
[0008] In the method of making a sound when a noisy place and an operator are persons hard of hearing it cannot check. At the place which will be troubled if a sound comes out this sound becomes obstructive.
[0009] It is most natural to perceive to have operated the switch part after all with the finger of the person who operated it and it is rational.
[0010] Then this invention sets it as the main purpose to provide the display panel with a switch using the thin switch and it which can detect having operated that switch part with a finger employing efficiently the feature of a touch panel that it can slim down extremely.
[0011]
[Means for Solving the Problem] This invention is characterized by a thin switch comprising the following.
A touch panel operational with about 0 in a stroke which has one or more switch parts a table of a touch surface thru/or near back and pushes it in.
It answers that at least one switch part of this touch panel was operated and is an excitation means of the touch panel concerned which vibrates a touch surface at least.

[0012] This invention is characterized by a display panel with a switch comprising the following.
A display panel which has an information display function.
A transparent or translucent touch panel operational with about 0 in a stroke which is arranged near the upper part of this display panel has one or more switch parts a table of a touch surface thru/or near back and pushes it in.
It answers that at least one switch part of this touch panel was operated and is an excitation means of the touch panel concerned which vibrates a touch surface at least.

[0013] A touch surface is a field which a person of a touch panel touches. A table of a touch surface thru/or the neighborhood of back mean that any near back [of a touch surface] the surface of a touch surface itself and near front [of a touch surface] may be sufficient. Operation of a switch part is meaning changing a state of a switch part and making it one typically.
[0014] According to the above-mentioned thin switch if a switch part of the touch panel is operated it will be answered and it will get across to a finger of a person of the touch panel concerned whom a touch

surface was vibrated at least and the vibration operated by an excitation means. Therefore it can perceive having operated a switch part with a finger by vibration of a touch surface.
[0015] <DP N=0003> <TXF FR=0001 HE=250 WI=080 LX=0200 LY=0300> Since a display panel with the above-mentioned switch is having substantially structure which has arranged the above thin switches which used a touch panel near the upper part of a display panel It can perceive having operated a switch part of a touch panel by the same operation as the above-mentioned thin switch with a finger by vibration of a touch surface. And since between a touch panel and display panels can be made to approach and display information of a display panel will be displayed by it immediately near the touch panel the display information is dramatically legible.
[0016]
 [Embodiment of the Invention] Drawing 1 is a sectional view showing the example of the display panel with a switch using a thin switch provided with a resistance film system touch panel. In this example the one or more switch parts 4a are formed near back [of the touch surface 4b of the touch panel 4].
[0017] The display panel with a switch of this example arranges the display panel 2 which has an information display function at the pars basilaris ossis occipitalis in the case 20 and it is making its structure which has arranged the thin switch 50 near the upper part of this display panel 2.
[0018] It is not asked whether the information which the display panel 2 has an information display function in short ***** it and is displayed is a constant or it is variable information or is spontaneous light and whether it has a back light etc. For example although this display panel 2 is a liquid crystal display typically in addition a mere sheet plate etc. which indicated EL (electroluminescent element) display a plasma display CRT an LED array the thing that combined the inprinting board and liquid crystal shutter which display information and the photogen which illuminates it and a light reflector and also information may be sufficient. the display panel 2 -- for example a sheet plate etc. -- like -- ***** -- in the case of a thin thing it may be attached to the rear face of the touch panel 4.
[0019] what is necessary is just to select the structure of the case 20 suitably according to the kind of display panel 2 etc. The case for thin switch 50 and the case for display panel 2 may be set aside.
[0020] In this example the viewing area 2a which displays the contents chosen near the lower part of each switch part 4a of the touch panel 4 which constitutes the thin switch 50 by operation of the switch part 4a concerned is formed in the display panel 2 respectively. Therefore selection and operation of the desired switch part 4a become easy.
[0021] The thin switch 50 is provided with the following.
 The touch panel 4 of a resistance film system [this example].
 The source 30 of excitation which constitutes the excitation means which vibrates the touch-panel 4 whole which answers that at least one switch part 4a of this touch panel 4 was operated and includes the surface touch surface 4b.

[0022] This touch panel 4 forms the one or more switch parts [one / the switch parts / by being lightly pushed from the outside (that is a stroke. about 0)] 4a near the surface of a hard board and moreover its whole is transparent or <TXF FR=0002 HE=250 WI=080 LX=1100 LY=0300> translucent in this example. Like [if an example is shown more] the example shown for example in drawing 2 the touch panel 4 changes in piles the transparent thin plate 16 with which the transparent thin plate 10 which has two or more openings 12 was piled up and also the transparent electrode 18 was formed on it at the undersurface on the transparent hard board 6 by which the transparent electrode 8 was formed in the upper surface. The transparent electrodes 8 and 18 may also have a case of the electrode of two or more stripe shape which intersects perpendicularly mutually one electrodes 18 for example a transparent electrode may be two or more electrodes and the electrode 8 of another side for example a transparent electrode may be a common electrode. Since the transparent thin plate 16 is sheet metal it has flexibility.
[0023] The hard board 6 is used [since the touch-panel 4 whole is floated from the display panel 2] downward in order to maintain the flat plate shape and to make vibration from the source 30 of excitation easy to tell the touch-panel 4 whole. This hard board 6 comprises a transparent acrylic board and clear glass board etc. for example. But the comparatively soft touch panel formed using the transparent sheet may be piled up on a substrate hard [other] (on a hard board transparent in the case of this example). Instead of providing the hard board of touch-panel 4 exclusive use the display panel 2 may be made into a hard thing and it may be made to serve as the above-mentioned hard board.
[0024] In this touch panel 4 that surface more specifically the surface of that transparent thin plate 16 If the switch part 4a is formed in the portion of each opening 12 which is the touch surface 4b which people touch and is near [the] the back side and the portion of the

desired opening 12 is lightly pushed from the transparent thin plate 16 sideOne [the transparent thin plate 16 and the transparent electrode 18 of a portion which were pushed bendand / the transparent electrode / the transparent electrode 18 contacts the lower transparent electrode 8 through the opening 12and] electrically. howeverthe size of each switch part 4ashapea positiona numberetc. may use two or more small switch parts 4a as one (namely-- carrying out multiple connection electrically) switch part collectively arbitrarily.
[0025]Although the edge part of this touch panel 4 may be directly fixed to the case 20 again with reference to drawing 1In this examplein order to carry out that it is easy to vibrate the touch-panel 4 wholethe touch panel 4 is floated from the case 20and that edge part is supported from the case 20 via two or more elastic bodies 24. This elastic body 24 is attachedfor example near the four corners of the touch panel 4. Although plate-like flat spring like the example shown in drawing 1 may be sufficient as each elastic body 24 for exampleif it is made into the flat spring of the shape of a corrugated panel like the example shown in drawing 4it will become that it is much more easy to vibrate the touch panel 4. A coil spring may be sufficient as each elastic body 24in addition rubberspongeetc. may be sufficient as it.
[0026]In this examplealthough the edge part 22 of the case 20 has hung on the edge part of the touch panel 4 and may carry out direct contact of this edge part 22 and touch panel 4in order to carry out that it is easy to vibrate the touch panel 4the small crevice 26 is established in this example. <DP N=0004><TXF FR=0001 HE=250 WI=080 LX=0200 LY=0300>when establishing the crevice 26the elastic body 42 which has water proof and a dustproof function may be formed there like the example shownfor example in drawing 5. This elastic body 42 is spongerubber membraneetc.for example. This thin switch 50 whole can be easily made into water proof and the dustproof structuremaking vibration of the touch panel 4 easyif the above elastic bodies 42 are formedsince the touch panel 4 has neither a hole nor a crevice and it has water proof and a dustproof function from the first.
[0027]Between the edge part of the above-mentioned touch panel 4and the case 20the source 30 of excitation which vibrates the touch-panel 4 whole including the touch surface 4b is established in this example. But although it is the touch surface 4b that it is necessary to make it vibrate trulysince the surface of the touch panel 4 is the touch surface 4b as it is in this exampleit is not indispensable to only use to vibrate the touch-panel 4 wholeand to vibrate the touch-panel 4 whole. Although the number of these sources 30 of excitation may be oneif they are made into plurality and it is distributed and arranged to the edge part of the touch panel 4they can vibrate the touch-panel 4 whole more uniformly.
[0028]Each source 30 of excitation is a piezoelectric transducer as an example in this example. A piezoelectric transducer is an element which vibrates a piezoelectric board by impressing a volts alternating current to inter-electrode [which was provided in both sides of the piezoelectric board] as everyone knows. An electrostrictive actuator is one of those which have the almost same structure as this piezoelectric transducerand it may be used for this source 30 of excitation.
[0029]The frequency which vibrates the touch panel 4 by the source 30 of excitationSince it will become the rude thing in which the feel which gets across to a finger was rough if not much lowand a finger will become ticklish if not much highit is preferred to carry out within the limits of 50 Hz - 150 Hzand especially within the limits of 80 Hz - 130 Hz is preferred also among them. Also in other examplesit is the same.
[0030]An example of a drive circuit which drives each source 30 of excitation electrically is shown in drawing 3.
[0031]The touch panel 4 has the transparent electrode 8 of m lineand the transparent electrode 18 of n sequence in this example (m and n are one or more integers)and is the switch part 4a which each of those intersections mentioned above. Each of these transparent electrodes 8 and 18 are pulled out in order to connect with the circuit (graphic display abbreviation) of the exterior which specifies the switch part 4a to which pressing operation was performedand they are connected to the detector circuit 52.
[0032]The detector circuit 52 detects that at least one switch part 4a of the touch panel 4 was operatedand while the switch part 4a concerned is operatedit outputs the predetermined level Sfor examplethe detecting signal of a high levelall the time. This detector circuit 52 can consist of publicly known artfor example using the 1st OR circuit by which the transparent electrode 8 of 1 - m line was connected to the input partthe 2nd OR circuit by which the transparent electrode 18 of 1 - n sequence was connected to the input

part and the AND circuit which asks for and [of the output from both OR circuits].
[0033]The detecting signal S from this detector circuit 52 is given to the exchange oscillator 54. <TXF FR=0002 HE=250 WI=080 LX=1100 LY=0300>while answering this detecting signal S and giving it the exchange oscillator 54 is put in block in each source 30 of excitationsupplies a volts alternating current and drives them. Between this exchange oscillator 54 and the source 30 of excitationan amplifying circuit may be provided if needed. Since the frequency of the output of this exchange oscillator 54 and the frequency of vibration of the source 30 of excitation are mutually equal fundamentallyas mentioned aboveas for the frequency of the output of this exchange oscillator 54it is preferred to carry out within the limits of 50 Hz - 150 Hzand especially its within the limits of 80 Hz - 130 Hz is preferred also among them.
[0034]May attach this detector circuit 52 and the exchange oscillator 54 to the thin switch 50 of this example by storing in the case 20 mentioned aboveandIt may store in the apparatus of the other party to which this thin switch 50 is connectedwithout making it suchor may constitute using a circuita microcomputeretc. which were formed there. The same may be said of the detector circuits 92 and 108 mentioned later.
[0035]If it is made one by pushing the one arbitrary switch part 4a of the touch panel 4 if operation of the thin switch 50 shown in drawing 1 is explainedIt is detected by the detector circuit 52the detecting signal S is outputted from thereaccording to ita volts alternating current is supplied to each source 30 of excitation from the exchange oscillator 54each source 30 of excitation vibratesand the touch-panel 4 whole which includes the touch surface 4b by it is vibrated. And it gets across to the finger of the person whom vibration of this touch panel 4 operated. Thereforeit can perceive having operated the switch part 4a with the operated finger. As a resultsense of security can be given to the person who operated it.
[0036]If the pressing operation of the switch part 4a of the touch panel 4 is stoppedthe switch part 4a concerned is turned off by itselfit will be answeredthe output of the detecting signal S from the detector circuit 52 and the output of the volts alternating current from the exchange oscillator 54 will stopand vibration of the touch panel 4 will stop.
[0037]Thusit is a finger of the person who operated it in this thin switch 50and since what (it was made one typically) the switch part 4a of the request of the touch panel 4 was operated for can be perceivedit is the most natural and rational. Thereforeunlike the method of changing the display of the display panel of a conventional examplewhen the operator has turned to widthalso when it is a visually handicapped personit can perceive certainly. Unlike the method of making the sound of a conventional examplealso when a noisy place and an operator are persons hard of hearingit can perceive certainly. It can be used convenient at all also at the place which will be troubled if a sound comes out.
[0038]The display panel with the above-mentioned switch using such a thin switch 50since between the touch panel 4 and the display panels 2 can be made to approach and the display information of the display panel 2 will be displayed by it immediately near the touch panel 4in addition to the above effects of the thin switch 50the effect that the display information of the display panel 2 is very legible is also acquired.
<DP N=0005><TXF FR=0001 HE=250 WI=080 LX=0200 LY=0300>[0039]Each source 30 of excitation is things other than the piezoelectric transducer mentioned above or an electrostrictive actuatorand may be constituted. Also in other examples mentioned laterit is the same.
[0040]For examplethe source 30 of excitation may consist of the electromagnet 32 which wound the coil 36 around the iron core 34and the permanent magnet 38 attached to the touch panel 4 so that a crevice might be opened in it and it might be countered like the example shown in drawing 4. Alternating current is supplied from the exchange oscillator 54 mentioned above on this electromagnet 32. In the magnetic pole of the iron core 34N and S can occur by turns by itthe permanent magnet 38 which counters it can be attracted or repelledand the touch panel 4 can be vibrated by it. The number of the magnetic poles of the iron core 34 may be oneand they should just make the n pole or the south pole of the permanent magnet 38 counter it in that case. Although ferromagneticssuch as a griddlemay be used instead of the permanent magnet 38since the direction which uses the permanent magnet 38 can also use the magnetismexciting force becomes larger. If it puts in another waythe output of the exchange oscillator 54 can be made small and power-saving can be attained.
[0041]The source 30 of excitation may consist of electromagnetism solenoids which have the plunger connected to the touch panel 4a coil which attracts itetc. Alternating current is supplied from the exchange oscillator 54 mentioned above in this electromagnetism solenoid. By ita plunger can vibrate and

the touch panel 4 can be vibrated.
[0042]The source 30 of excitation has attached the weight which carried out eccentricity to the axis of rotation and may constitute it from a vibrating motor with which the motor itself vibrates. In that case what is necessary is just to provide DC power supply or the amplifying circuit which amplifies the detecting signal S instead of the exchange oscillator 54 mentioned above. The touch panel 4 can be vibrated by contacting or attaching this vibrating motor to the touch panel 4 and rotating it.
[0043]In order that the touch panel 4 might combine with the display panel 2 arranged downward in the case of the above-mentioned example as it mentioned above considered it as the transparent thing but. It does not necessarily need to be transparent and may be translucent and what is necessary is just to be able to penetrate the light from the lower display panel 2 in short according to the display information of the display panel 2 etc.
[0044]The above-mentioned thin switch 50 can also be used without piling up on the display panel 2 for example is independent separately [the display panel 2] about the thin switch 50 or since it can also be used combining other apparatus and it is not necessary to make the light from the lower display panel 2 penetrate in that case the touch panel 4 does not need to be transparent or translucent and may be opaque. In that case for discernment of the switch part 4a etc. necessity may be accepted and a character a sign etc. may be filled in stamped and stuck on the surface of the touch panel 4. Also in other examples mentioned later it is the same.
[0045]By the way the <TXF FR=0002 HE=250 WI=080 LX=1100 LY=0300> touch panel of the photoelectric method with which the light to which the touch panel came out of the light emitting device besides the resistance film system above touch panels 4 is [a thing / it] intermittent or attenuates going into a photo detector or the touch panel of the ultrasonic system which is [a thing / it] intermittent or attenuates that the ultrasonic wave which came out of the ultrasonic oscillating element goes into a vibration receiving element may be sufficient. Then next the example using the touch panel of a photoelectric method or the touch panel of the ultrasonic system is described. However the same portion as a previous example omits duplication explanation and explains a point of difference with a previous example to a subject.
[0046] Drawing 6 is a sectional view showing selectively an example in case the touch panel 114 is a photoelectric method and since the portion below the touch panel 114 is the same as that of a previous example the graphic display is omitted here. In this example the one or more switch parts 114a are formed near front [of the touch surface 114b of the touch panel 114].
[0047]The touch panel 114 also refers to drawing 7 and carry out for [of two or more photo detectors 90 which change it into an electrical signal in response to two or more light emitting devices 84 which output the light 86 and the light 86 concerned] relatively in all directions into the edge part 22 of the case 20 and it arranges them in composition in which the matrix form optical path 88 was formed to the space near the surface of the hard board 82 is carried out. Near the intersection of the two optical paths 88 serves as the switch part 114a respectively. The number of the optical paths 88 which carry out matrix arrangement is arbitrary at $m \times n$ (m and n are one or more integers).
[0048]The hard board 82 comprises a transparent or translucent glass plate or acrylic board for example. Each light emitting device 84 is LED a semiconductor laser etc. for example. Each photo detector 90 is a photo-diode a photo transistor etc. for example. It is the same as that of the case of a previous example whether the elastic body which has water proof and a dust proof function is provided in whether a crevice is opened between this hard board 82 and the edge part 22 of the case 20 and there.
[0049]Since infrared light is not conspicuous the light 86 outputted from each light emitting device 84 is preferred but of course visible light may be sufficient as it. The method made to always emit light may be sufficient as the method which makes each light emitting device 84 emit light and the method (this is also called a luminescence method or a scanning method one by one) made to emit light in order using a microcomputer etc. may be sufficient as it. This microcomputer may be used also [what / constitutes the detector circuit 92 explained below for example].
[0050]As this example shows to each photo detector 90 in every direction at drawing 7 the signal from each photo detector 90 is answered the function which outputs the position signal P which detects the position (coordinates) of the intersection of the optical path 88 to which light volume fell namely specifies the switch part 114a to which operation was performed and with which the position is expressed. The detector circuit 92 which has a function which outputs the detecting signal S which detected and mentioned above that at least one switch part 114a was operated is connected. It

is the same as that of the case of the example mentioned above after the exchange oscillator 54 and explanation of the operation is omitted.
[0051] The surface of the hard board 82 is the touch surface 114b which people touch and it is made to vibrate in this example by the source 30 of excitation which mentioned above the hard board 82 whole which forms this touch surface 114b. That is if the touch surface 114b is touched with a finger the optical path 88 is interrupted with a finger and the arbitrary switch parts 114a are operated it is detected by the detector circuit 92 it is answered with the exchange oscillator 54 the source 30 of excitation will drive the hard board 82 will vibrate and it will get across to a finger. Therefore it can perceive having operated the switch part 114a with the operated finger.
[0052] The hard board 82 may make that display panel 2 serve as the above-mentioned hard board since the main functions form the touch surface 114b in this example when the hard display panel 2 (refer to drawing 1) is arranged downward. That is it is good also considering the surface of the display panel 2 as a touch surface to omit the hard board 82. In that case what is necessary is just to vibrate the surface by the source 30 of excitation even if there are few these display panels 2.
[0053] Drawing 8 is a sectional view showing selectively an example in case the touch panel 124 is an ultrasonic system and since the portion below the touch panel 124 is the same as that of the case of a previous example the graphic display is omitted here. In this example the one or more switch parts 124a are formed in the surface of the touch surface 124b of the touch panel 124 itself.
[0054] This touch panel 124 is based on the same technical thought as the touch panel indicated for example to U.S. Pat. No. 5177327.
[0055] Namely this touch panel 124 also refers to drawing 9 and make the surface of the edge part of the hard board 94 carry out for [of it] relativity in all directions arrange it and two or more vibration receiving elements 106 which change it into an electrical signal in response to two or more oscillation elements 96 which output the ultrasonic wave 100 and the ultrasonic wave 100 concerned on the surface of the hard board 94. Composition in which the matrix form ultrasonic course 102 was formed is carried out. Near the intersection of the two ultrasonic courses 102 serves as the switch part 124a respectively. In this case since the ultrasonic wave 100 has very high directivity a possibility that the ultrasonic wave 100 which spreads the one ultrasonic course 102 may enter and interfere in the next ultrasonic course 102 does not usually have it. The number of the ultrasonic courses 102 which carry out matrix arrangement is arbitrary at $m \times n$ (m and n are one or more integers).
[0056] The hard board 94 is a transparent or translucent glass substrate for example.
[0057] The ultrasonic wave 100 is a surface acoustic wave in this example the ultrasonic wave 100 from the oscillation element 96 is led to the surface of the substrate 94 via the waveguide 98 and the ultrasonic wave 100 of the surface of the substrate 94 is led to the vibration receiving element 106 via the waveguide 104. Each oscillation element 96 and each vibration receiving element 106 are piezoelectric transducers for example. These are dedicated to the space part in the edge part 22 of the case 20 in this example. It is the same as that of the case of a previous example whether the elastic body which has water proof and a dustproof function is provided in whether a crevice is opened between the edge part 22 of this case 20 and the substrate 94 and there.
[0058] <TXF FR=0002 HE=250 WI=080 LX=1100 LY=0300> As this example shows to each vibration receiving element 106 in every direction at drawing 9 the signal from each vibration receiving element 106 is answered The function which outputs the position signal P which detects the position (coordinates) of the intersection of the ultrasonic course 102 which the ultrasonic wave 100 decreased namely specifies the switch part 124a to which operation was performed and with which the position is expressed The detector circuit 108 which has a function which outputs the detecting signal S which detected and mentioned above that at least one switch part 124a was operated is connected. It is the same as that of the case of the example mentioned above after the exchange oscillator 54 and explanation of the operation reduces a labor.
[0059] The surface of the hard board 94 is the touch surface 124b which people touch and it is made to vibrate in this example by the source 30 of excitation which mentioned above the hard board 94 whole including this touch surface 124b. That is if the touch surface 124b is touched with a finger the ultrasonic wave 100 is absorbed with a finger and the arbitrary switch parts 124a are operated it is detected by the detector circuit 108 it is answered with the exchange oscillator 54 the source 30 of excitation will drive the hard board 94 will vibrate and it will get across to a finger. Therefore it can

perceive having operated the switch part 124a with the operated finger. [0060] The distortion wave which spreads the inside of the hard board 94 may be used instead of the above surface acoustic waves as the ultrasonic wave 100. In that case the oscillation element 96 and the vibration receiving element 106 are attached to the end face in which the hard board 94 carries out for relativity. This method is also called inner surface waveguide type. In the case of this method it is possible that the one or more switch parts 124a which were mentioned above are formed near back [of the touch surface 124b of the surface of the hard board 94]. [0061] Although each made the excitation direction of the touch surface by the source 30 of excitation the sliding direction of the touch surface in the above-mentioned example it is not limited to it it may be aimed to meet the direction of other for example a touch surface and in short a touch surface should just vibrate. [0062] On the surface of the all directions-type touch panel mentioned above like the example shown for example in  Since a finger can be positioned with few level differences produced into the portion of the through hole 134 if the transparent thin plate 132 which has the through hole 134 may be put on the portion corresponding to the switch part of those touch panels and it is made such positioning of the finger to a switch part becomes easily and certain. The portion which that becomes thin and has a level difference in it although penetration has not been carried out instead of the through hole 134 to this transparent thin plate 132 may be provided and even if it makes it such the same effect as the above is acquired. [0063] [Effect of the Invention] Since this invention is constituted as above-mentioned it does the following effects so. [0064] Since the above excitation means were combined with the touch panel according to the thin switch according to claim 1 it can perceive having operated the switch part of the touch panel with a finger by vibration of the touch surface of a touch panel. That is it can DP N=0007 TXF FR=0001 HE=125 WI=080 LX=0200 LY=0300 perceive having operated the switch part with a finger employing efficiently the feature of a touch panel that it can slim down extremely. As a result sense of security can be given to the person who operated it. [0065] Thus since it can perceive having operated the switch part of the touch panel with the finger of the person who operated it according to this thin switch it is the most natural and rational. Therefore unlike the method of changing the display of the display panel of a conventional example when the operator has turned to width also when it is a visually handicapped person it can perceive certainly. Unlike the method of making the sound of a conventional example also when a noisy place and an operator are persons hard of hearing it can perceive certainly. It can be used convenient at all also at the place which will be troubled if a sound comes out. [0066] Since the display panel with a switch according to claim 2 is having structure which has arranged the thin switch [like] according to claim 1 which used the touch panel near the upper part of a display panel it can detect having operated the switch part of the touch panel with a finger by vibration of a touch surface. Therefore the same effect as the thin switch of being able to give sense of security to the person who operated it according to claim 1 is done so. [0067] And since between a touch panel and display panels can be made to approach and the display information of a display panel will be displayed by it immediately near the touch panel the effect that the display information is very legible also does so. SDO TXF FR=0002 HE=035 WI=080 LX=0200 LY=1550 [Brief Description of the Drawings] SDO TXF FR=0003 HE=160 WI=080 LX=1100 LY=0300 [Drawing 1] It is a sectional view showing the example of the display panel with a switch using a thin switch provided with a resistance film system touch panel. SDO TXF FR=0004 HE=160 WI=080 LX=1100 LY=0300 [Drawing 2] It is a sectional view decomposing and showing an example of a resistance film system touch panel. SDO TXF FR=0005 HE=160 WI=080 LX=1100 LY=0300 [Drawing 3] It is a figure showing an example of a circuit which drives the source of excitation electrically. SDO TXF FR=0006 HE=160 WI=080 LX=1100 LY=0300 [Drawing 4] It is a sectional view which expands the example which used the electromagnet to the source of excitation and is shown selectively. SDO TXF FR=0007 HE=160 WI=080 LX=1100 LY=0300 [Drawing 5] It is a sectional view which expands the example which provided the elastic body which has water proof and a dustproof function and is shown selectively. SDO TXF FR=0008 HE=160 WI=080 LX=1100 LY=0300 [Drawing 6] It is a sectional view showing selectively an example in case a touch panel is a photoelectric method. SDO TXF FR=0009 HE=160 WI=080 LX=1100 LY=0300 [Drawing 7] It is a top

view showing the touch panel of drawing 6 with the circuit which
 drives the source of excitation electrically.
[Drawing 8]It is a sectional view
 showing selectively an example in case a touch panel is an ultrasonic
 system.
[Drawing 9]It is a top
 view showing the touch panel of drawing 8 with the circuit which
 drives the source of excitation electrically.
[Drawing 10]It is a top view showing
 an example of the transparent thin plate piled up on a touch
 panel.
[Description of Notations]
2 Display panel
4 A resistance film
 system touch panel
4a Switch part
4b Touch surface
30 The source of
 excitation
32 Electromagnet
38 Permanent magnet
50 Thin switch
52
 Detector circuit
54 Exchange oscillator
114 The touch panel of a
 photoelectric method
114a Switch part
114b Touch surface
124 The
 touch panel of an ultrasonic system
124a Switch part
124b Touch
 surface
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